

Learning Style Role in Varieties of Blended Learning

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ABSTRACT

Blended learning is a form of learning that is the current trend, but it still needs to be explored several factors that play a role when implementing it. Learning style is a critical factor in learning, which is divided into four types, while blended learning (a combination of online and face-to-face) is possible in a variety of forms. This experiment was formed in three different combinations so that the experiment with a 4x3 design (12 groups). Seven group members based on the type of learning style learn in the three online and face-to-face integration forms. Data were collected at the end of the experiment and analyzed using 2-Way ANOVA at the .05 significance level through IBM SPSS 25. The competencies of participants found were significantly different based on the different types of learning styles and the variety of online and face-to-face integration. The average difference test results show that it turns out that the competency of participants with certain types of learning styles, is better in a particular form of learning integration than other types. So, obtaining maximum results in blended learning should first be traced to the type of student learning style and place on the most appropriate blend of learning.

INTRODUCTION

Some of educational and teaching researchers claim blended learning (online and face-to-face combination) has advantages. Online and face to face can be mutually reinforcing when learning takes place [1] – [7]. In other words, one covering up the weaknesses of the other [8] – [12]. Moreover, the model appropriate to form quality teachers [13] – [15] because it has properties of pedagogical, student-centered, and collaborative [16] – [23]. It can load the inquiry-based learning, problem-based learning, project-based learning, which are related to authentic professional practices, phenomena, problems, and situations. The digital and mobile communication in the practice of making content interactive and lessons adapted to the cultural preferences of students to support the model. So, It can accommodate the students now and in the future [24] by transferring knowledge and work while learning takes through Information and Communication Technology (ICT) [25] - [28]. The learning more dynamic, interactive, and motivated, created the independence of learning and a rich understanding of students [29] – [33]. The model also can provide opportunities for students to get the cognitive presence and social experience through discussions synchronously or asynchronously with colleagues and facilitators [34], [35], [36].

Nevertheless, there is a finding state that learning outcomes through blended learning do not entirely differ significantly from traditional learning [37]. Also, some statements contradict each other that claim learning styles do not affect learning achievement [38], [39], but others do not fully agree on it that learning styles have a significant influence [40], [41], [42]. However, we think it is necessary to explore that information in order to consider implementing blended learning because no one has explained the impact of different learning styles on the implementation of blended learning. It becomes a clue to investigate other factors that might also play a role in influencing the learning process through blended learning. Moreover, until now, not enough information about the form of integration that is most suitable for each type of teacher candidate's learning style. Student teachers generally come from a variety of situations and conditions, families, home areas, as well as types of education and economic levels. Hence, We are interested in investigating the use of blended learning for teaching

Keywords: Blended learning, Online, Face to face, Learning style, Competence Applying the styles to an existing paper

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them in order to obtain maximum learning outcomes. The form of online and face-to-face integration will come to the attention of this study with the thought that the diversity of integration is possible to have a different impact on each group of study participants. It based on some claim that the success of blended learning is not the integration of teaching in the classroom with digital media in simple ways, but patterns and practices of learning have changed [43], [44]. Likewise, the diversity of student characteristics is also possible to contribute to differences in the results obtained, and differences in the characteristics of the learning material itself [45]. Learning styles be our focus because they have an essential role in the learning process [46], [47]. The impact of different learning styles and different forms of integration on competence is essential in investigating because different individuals in different conditions gave different results [48], [49], [50].

Electrical teacher candidate competencies are essential because they have become necessary provisions to involve them in further teaching assignments [51], [52], and master the theory and practice of electricity [53] for planning, implementation, and evaluation of learning [54], [55]. It is the basis for investigating learning styles' role in varieties blended learning in teaching prospective teacher students by asking some questions, namely, (1) How are the competencies of students taught by blended learning based on their learning styles?, (2) Which form of blended learning is most appropriate for each group of students based on their learning style?. The answers we received contributed to efforts to improve the competency of future technical teacher candidates.

LITERATURE REVIEW

Teacher Candidates' Competence in Blended Learning

Several sources explain that the incorporation of online learning and face-to-face can provide excellent opportunities for students to interact with fellow students as well as with lecturers online [56], [57]. Some people have recognized the form of convergence between technology-based environments, and traditional arrangements are the right thing, and It implemented in a virtual laboratory also in flipped classrooms [58], [59]. In this way, students can get learning assistance in the guidance form or demonstration/simulation, both

directly and indirectly [60], [61]. It is possible to make independent learning and collaboration [62] because more communication channels supported [63].

Students' speed in processing information is varied [64], [65], so choosing the suitable learning for each group is essential. A variety form of online and face-to-face mixtures is possible to fulfill the learning needs. The provision of learning assistance is efficient in each group based on the type of individual learning characteristics shared [66], [67]. Online learning can provide opportunities for prospective teacher students who are fast learners and have high learning creativity. Face-to-face learning assisted slow learners and provided encouraging results [68] – [73]. The study time for students independently and lecturer involvement portion in the classroom arranged as needed. In shaping the professional prospective teachers' competence, It delivered teaching material through blended learning, which combines online and face-to-face instruction. The prospective electrical engineering teacher needs to understand the concepts of electricity and have skills in selecting and using the appropriate tools on the task, efficient use of time in carrying out tasks, work safety, and the level of precision of the work results.

In this study, we make variations in three types of combinations of online and face-to-face instruction adjusted for learning material. The three types are 25% online and 75% face-to-face instruction, 50% online and 50% face-to-face instruction, 75% online and 25% face-to-face instruction. It refers to the individual's speed difference in digesting information. Diversity of integration intended to be able to accommodate the diversity of differences that students have. Online provides broad opportunities for students to learn independently, especially those who have high learning creativity and face-to-face is to facilitate and motivate slow students [74] – [77]. Thus, their competences formed together maximally because it is possible for these differences accommodated [78], [79]. It looked through measurement and assessment.

Blended Learning and Learning Style

Learning style is a process where knowledge formed through the transformation of experience based on learning experience theory (Kolb, 1984), which starts from the stages of CE (Concrete Experience), RO (Reflective Observation), and AE (Active Experiments) to AC (Abstract Conceptualization). Teaching materials refer to the form of delivering in blended learning practices so that students with various types of learning styles served. The bipolar continuum (CE and AC) is orthogonal to the bipolar continuum of both RO and AE, which are contiguous modes of preference from the experiential learning cycle. They lead to four basic learning styles combination which known Diverger (between CE and RO), Assimilator (between RO and AC), Converger (between AC and AE), and Accommodator (between AE and CE). Someone may have one of them but can learn and use the other modes. Their differences illustrated by divers who have strong imaginative abilities and are good at using various points of view to see things, creative, and can work with others. Those who prefer inductive thinking and abstract ideas and make theoretical models are assimilators. Convergent has a strong practical orientation; they are generally deductive and tend not to be emotional while accommodators love to do things and solve problems intuitively and take risks here and now [79].

The learning agent uses a variety of approaches to accommodate diverse modes of student learning, as proposed [80]. Some people say that non-traditional students generally prefer to start from the AC-AE quadrant, whereas traditional students will prefer the RO-AC quadrant [81], [82]. It illustrates that the use of a variety of a combination of face-to-face instruction and online instruction in blended learning also have different types of learning styles. More online portions may be more suitable for convergent types. For this reason, it is necessary to choose the right form of learning to give maximum results - that is, high student performance in the course [83], [84], [85]. It illustrates the combination of online and face-to-face teaching matching for certain types of prospective teachers learning styles to form maximum professional competence.

METHOD

Tools and Materials

As a container in this study, We built learning webs (URL: <http://jpte-ft-unimed.edu20.org>). IT and learning technology experts were involved in validating completeness of navigation, information loading space, the display aspects, and ease of use of the site. They gave some inputs to make the web feasible. We prepare teachings material of the electrical power system, which refers to the Department of Electrical Engineering Education curriculum. We involve three experienced lecturers to assess the conformity aspects of the material content, which scopes with material description structure, learning objectives, language clarity, practice management, image clarity related to the material, video display. Several parts are corrected, and it is feasible to implement.

Mastery theory tests and skills assessment sheets as competency test instruments are developed, referring to learning objectives. Measuring theory mastery use 25 questions in the form of essays. Dexterity using tools on the task, choosing the right tool, the precision level of the work results, time-efficient use in carrying out tasks and, work safety include in practical skills assessment sheet. The theory mastery scores determined by giving a score of two if true, and 0 if wrong for all items, so the maximum total score becomes 50. The range score of Skill Assessment is 0 – 10 for each aspect, therefore the maximum total score also 50. Then, the competency score is a combination of the two scores. We test the validity of the instrument first by conducting a test that involved 35 participants and three raters involved (the lecturer in electrical engineering). It finds no significant differences between them ($F=.145$, $Sig=.865$) and concluded it is feasible to use. Then, We use the Kolb Learning Style Inventory 4.0 for tracking participants' learning style types,

Participants and Design

Through the Kolb Learning Style Inventory 4.0, there were 84 people selected to become participants in the experiment. They consist of 21 peoples for each different learning style, namely Diverger (Di), Assimilator (As), Converger (Co), and Accomodator (Ac). A total of seven participants were randomly drawn from each group learning style to be placed in a study group with 25-75 mixes, 50-50 mixes, and 75-25 mixes so that the experimental group became a 3 x 4 design.

Procedure

Pretests are given in advance to all experimental groups to find out their knowledge base. Based on the analysis, initial competencies of them are not different significantly ($F=2.149$, $Sig.= 0.76 > .05$). Furthermore, the learning activities carried out. One lecturer in each group does teaching activities as long as 12 times in one semester. When learning online, the participants get different access codes for each learning group. Each of the learning group is BL1 (25 - 75 Blended, four times online and eight times face to face); BL2 (50 - 50 Blended, six times online and six times face to face); and BL3 (75 - 25 Blended, eight times online and four times face to face). They implement with the same time and material. As soon as the learning ends, It carries out the competency test, and record the competency data of each group member.

Data Analysis

The descriptive statistics used to describe competency data. Kolmogorov Smirnov Test and Levene Test use to test normality and homogeneity of data. The variety of types of learning styles, the different forms of learning, and the interaction of learning with learning styles' effect on competencies testing through two-way ANOVA at the significance level of .05. Moreover, differences in the average of competencies between learning groups and the type of learning style group through Post Hoc Test. Plotting of the competencies of each group type of learning style in each form of learning describes the most suitable combination. All data analyses carried out through IBM's SPSS 25 program.

RESULTS

Competence Description

The participants' competency description of each learning group ($n = 28$) shows that the 25-75 Blended Group is the highest score on average (Mean = 73.68; Sd = 7.977, followed by 50-50 Blended (Mean = 75.61; 6.437), and 75-25 Blended Group (Mean = 71.04; Sd = 5.818). Based on the learning style type group with 21 members scores, shows that the Assimilator type group members have the highest scores (Mean = 76.33; Sd = 7.492) than do members of the other groups Diverger (Mean = 74.76; Sd = 9.006), Accommodator (Mean = 72.19; Sd = 2.294), and Converger (Mean = 70.48; Sd = 7.336). Competence in Learning by learning style type ($n = 7$), Diverger's competency scores are the highest average score in the 25-75 blended learning group (Mean = 83.29;

Sd = 2.690), followed by the 50-50 blended group (Mean = 77.86; Sd = 2.911) and 75-25 blended group (Mean = 63.14). The average score of the Assimilator group sorted from the highest score in the 50-50 blended group (Mean = 84.00; Sd = 2.309), followed by the 25-75 blended group (Mean = 76.86; Sd = 4.670) and the 75-25 blended group (Mean = 68.14; Sd = 3. 579). The Converger learning style types have the highest competency score in the 75-25 blended group (Mean = 79.29; Sd = 3.773), followed by the 50-50 blended group (Mean = 68.43; Sd = 2.820) and the 25-75 blended group (Mean = 63.21; Sd = 3.147). Meanwhile, the Accommodator type has the highest competency score in the 75-25 blended group (Mean = 72.57; Sd = 2.070), followed by the 50-50 blended group (Mean = 72.14; Sd = 1.574) and the 25-75 blended group (Mean = 70.86; Sd = 1.676).

The participants competency score obtained in the learning group by learning style type ($n = 7$), the Diverger type had the highest scores in the 25-75 blended learning group (Mean = 83.29; Sd = 2.690) followed by the Assimilator (Mean = 76.86; Sd = 4.670), Accommodator (Mean = 70.86; Sd = 1.676), and Converger types (Mean = 63.71; Sd = 3.147). Participants' competency scores in the 50-50 blended learning group, sorted from the highest to lowest scores, are Assimilator (Mean = 84.00; Sd = 2.309), Diverger (Mean = 77.86; Sd = 2.911), Accommodator (Mean = 72.14; Sd = 1.574), and Converger types (68.43; Sd = 2.820). In the 75-25 blended group, the converger type scored the highest (Mean = 79.29; Sd = 3.773), followed by the Accommodator (Mean = 73.57; Sd = 2.820) , Assimilator (Mean = 68.14; Sd = 3.579), and Diverger types (Mean = 63.14; Sd = 2.193). Data normality is fulfilled ($N = 84$, Mean = 71.79, Std. Dev. = 6.174, Test statistic = .089), and (Asymp.Sig (2-tailed) = .113 > .05). Also, data homogeneity based on the Mean, Median, Median, and adjusted df, and the Trimmed Mean is Sig.> .05 so analysis continued.

Blended Learning's and Learning Styles' Influence

The various forms of Blended learning, learning styles, and their interactions influence the competence of the prospective teacher significantly (Intercept, $F = 51381.495$, $DF = 11$, $Sig. = .000 < .05$). Then Blended learning-BL varieties have a significant influence on competence ($F = 16,725$, $df = 2$, $Sig.=.00 < .05$) as well as the LS-style Learning variety ($F = 16,246$, $df = 3$, $Sig. = .00 < .05$). Also their interaction (BL * LS) is significant ($F = 57,219$, $Sig.= 00 < .05$). There are significant competence differences among blended learning groups (Table 1).

Table 1. Competence comparison among blended learning groups

(I) Blended	(J) Blended	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
25-75 Blended	50-50 Blended	-1.93*	.794	.046	-3.83	-.03
	75-25 Blended	2.64*	.794	.004	.74	4.54
50-50 Blended	25-75 Blended	1.93*	.794	.046	.03	3.83
	75-25 Blended	4.57*	.794	.000	2.67	6.47
75-25 Blended	25-75 Blended	-2.64*	.794	.004	-4.54	-.74
	50-50 Blended	-4.57*	.794	.000	-6.47	-2.67

*. The mean difference is significant at the .05 level.

Several pairs of groups are not significant different among groups of learning style types (Diverger-Assimilator, Mean Difference = .157; Sd = .916; Sig.=.324

> .05; Converger-Accommodator, Mean Difference = 1.71, Sd = .916, Sig. = .250 > .05) while other pairs are significant (Table 2).

Table 2. Competence comparisons among learning style groups

(I) LS	(J) LS	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Diverger	Assimilator	-1.57	.916	.324	-3.98	.84
	Converger	4.29*	.916	.000	1.88	6.70
	Accommodator	2.57*	.916	.032	.16	4.98
Assimilator	Diverger	1.57	.916	.324	-.84	3.98
	Converger	5.86*	.916	.000	3.45	8.27
	Accommodator	4.14*	.916	.000	1.73	6.55
Converger	Diverger	-4.29*	.916	.000	-6.70	-1.88
	Assimilator	-5.86*	.916	.000	-8.27	-3.45
	Accommodator	-1.71	.916	.250	-4.12	.70
Accommodator	Diverger	-2.57*	.916	.032	-4.98	-.16
	Assimilator	-4.14*	.916	.000	-6.55	-1.73
	Converger	1.71	.916	.250	-.70	4.12

The error term is Mean Square(Error)=8,512. An asterisk (*) signifies that the mean difference is significant at the .05 level.

Figure 1. depicts the competency of each group based on blended forms and learning styles combination. It appears as though people with the diverger learning-style type are better in 25-75 blended learning than

assimilators, converters, and accommodators (each of them in order) are in 50-50 blended, 75-25 blended, and 75-25 blended.

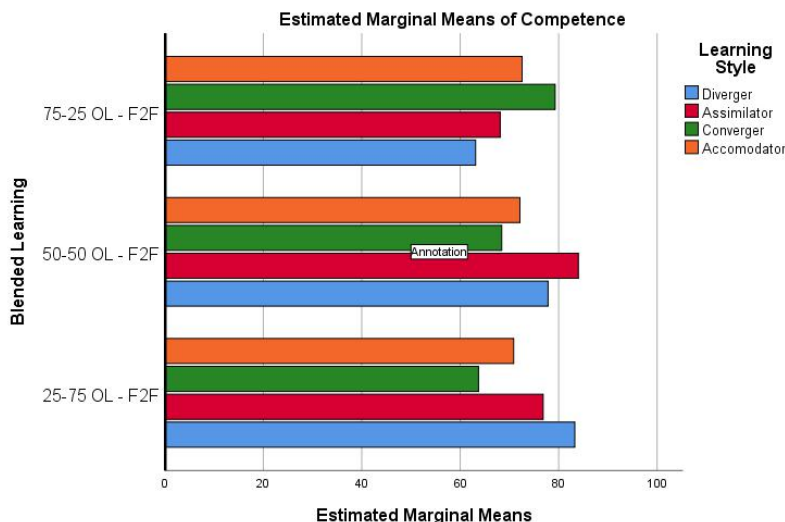


Fig. 1. Teacher candidates' competence based on learning style in blended learning

DISCUSSION

The diversity of online learning and face-to-face combination forms gave different impacts on teacher candidates' competencies, and It is in line with the findings of [86]. It shows that the composition of online and face-to-face learning is fundamental to consider when implementing blended learning. It also supports the findings of [44], that using blended learning is not only based on the integration of simple classroom teaching with digital media but also needs to consider other factors to make the blended learning superior in practice and can create diverse learning patterns and learning materials flexibly when helping students in their learning, as stated by [43].

In this condition, several experimental groups showed that the competence according to learning styles did not show a significant difference, especially those close to them, namely, the diverger type group against the assimilator type group and the converger type group towards the accommodator type group. It further

reinforces the finding of [42] that not all learning styles make a significant difference in academic achievement. It is possible because the learning process takes place close. That is, it occurs between the process of concrete experience and reflective observation (diverger type), which is close to the process of reflective observation and active experimentation (assimilator type). The same thing happens between the active experimentation process and abstract conceptualization (converter type). This borders on the process of abstract conceptualization and reflective observation (the type of accommodator). The diverger type group competence with the convergent type group is very different, and also the competence of the assimilator and accommodator group. However, this is in line with supporting research [41] and [40], which state that different learning styles provide significantly different learning outcomes.

Based on the learning group, the learning style type of diverger group showed higher competence in 25 percent of online and 75 percent of face-to-face learning

combinations, during the converger type group with a composition of 75 percent online and 25 percents. It gives the meaning of students with the type of diverger learning style that is better in learning that is more directed towards traditional learners, while the converger type group is non-traditional, as stated by [81] and [82]. While the group-type assimilators are better at learning with a composition of 50 percent online and 50 percent face-to-face learning, and the accommodator type is learning with a composition of 75 percent online and 25 percent face-to-face learning. It shows that different individuals in different conditions tend to produce different results in line with [48], [49], and [50]. Therefore it is vital to consider the characteristics of students when they want to teach through blended learning as recommended by [88]. As a teacher, it is crucial to choose the right strategy to obtain maximum results [89]. It is equally important to educate prospective teachers, as stated by [90].

CONCLUSION

Considering the composition form of online learning and face-to-face learning in blended learning in order to obtain maximum results in teaching prospective teacher students was discovered within this research. It has found that different types of learning styles have different impacts on the competency of prospective teachers when taught through blended learning. As the same as the portion diversity of online and face to face mergers, also have a different impact. The interaction between the learning styles of prospective teachers and blended learning also found to be significant. Teacher candidates' group competencies based on the type of learning style are different in each online and face-to-face blend group. So, for teaching them, it is necessary to pay attention to their type of learning style first as a basis for choosing the right approach and can obtain maximum learning outcomes.

Implications

Learning styles found to play an essential role in the process of forming teacher competency. Therefore, forming learning groups based on the learning styles of students should be considered so that the results obtained maximized. Learning styles from students are explored first, for that purpose.

Limitations

This study only focused on investigating the role of learning style in implementing three kinds of blended learning compositions. Participants involved were also still few, and the face-to-face approach was used only through lectures. The researchers furthermore made it possible to examine more broadly the role of other learning characteristics, including cognitive style and cognitive control, and see other faces to face approaches, including active forms of learning.

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